

The Definition and Measurement of Health and Disease

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IN PUBLIC HEALTH, as in most fields, morale and job satisfaction rise when goals can be defined clearly. When we can also gauge success in reaching these goals, usually termed "evaluation of effectiveness," we can see how well we are performing tasks.

Moreover, when all members of an agency agree on its goals and know how progress toward them is measured, administering the agency becomes easier. Decisions about future activities can then be made lower in the organizational hierarchy, and there is a greater consensus on the correctness of these decisions than when goals are intangible. However, health services administrators may have more difficulty than other administrators in using the guidelines of "management by objectives" because they lack a clear picture and good working definition of health.

Despite the health administrators' plight, not everyone agrees that a good definition is needed or, indeed, that a clear definition is possible. Admittedly, some concepts or bodies of experience are too elusive to submit to definition, and health may be such a concept. A neat but inadequate definition, moreover, may serve as an excuse to stop further thought. In addition, a strict definition may cramp the growth of a field and make it difficult to justify new and

helpful pathways which seem outside the scope of the definition.

Strong as these arguments against definitions may be, there is a rejoinder to each which should encourage us to improve the existing definitions. Definitions need not be perpetuated when better ones come along. A final argument favoring a better definition of health is that, during their basic training, many health workers are oriented to cure disease rather than to improve health. Thus, they find it more satisfying to treat illness than to promote health. In this discussion I propose to analyze current dilemmas in defining and measuring health and disease and to suggest ways to reach clearer definitions of these concepts.

Current Definitions of Health

Any attempt to define what health means lays the definer open to attack by critics armed with heavy reference books. Fortunately, this phenomenon has not prevented many groups and individuals from suggesting definitions, which may be divided into two types.

Asymptotic or open-ended concept. In the first type, the definitions that have an open-ended concept, health becomes an asymptote—an ideal on the horizon that can be approached but never reached. Death occurs just below the absolute zero of the scale, which has no fixed upper limit for maximum human functioning. Among such definitions, the most widely used is that in the Preamble to the Constitution of

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the World Health Organization: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." Its constant repetition in the past two decades confirms that this idealistic view has strong merits and appeal. It is, moreover, taken seriously and literally by many respected persons who regard it as an attainable if distant goal (1). What, then, are its weak points?

Probably the major one is incompleteness. While saying what health is, the statement uses words with meanings that are not self-evident. Such terms as "complete," "social well-being," and "disease and infirmity" all need explanation. Moreover, the definition does not explain what health does to organisms possessing it or how it may be measured. We need these terms interpreted to understand the definition.

How well does the definition support medical and public health practice? As a public relations slogan, the WHO definition seems most useful in an uncritical environment or when patients or population groups are too tactful to ask, "What techniques do you have to produce physical, mental, and social well-being in those who are free from disease or infirmity?" If we have no such techniques, can we justify membership in one of the health professions? If we be health professionals, can we reasonably claim a goal unreachable by present methods? Can we claim a sphere of influence which should favorably affect the multiple divorcee, the frequent job-changer, the juvenile delinquent, and the recently bereaved? If we run health agencies, can we be happy with an unreachable goal which continuously glides over the horizon?

The open-ended definition encourages certain activities, such as the "positive mental health" movement seeking growth, zest, and creativity of the mind. It backs popular health beliefs in the benefits of cold showers, jogging, consuming vitamin pills and laxatives, as well as the more organized, physician-supported spas in Europe. It may even underlie the alleged Scottish custom of prescribing soothing draughts of milk and whisky, the milk being reduced and cut off as well-being improves. Some of these activities are beneficial, but the value of others is doubtful.

How well does the WHO definition separate healthy patients or communities from those without this quality? First, it requires the ex-

clusion of disease and infirmity and second, and more difficult, showing that complete physical, mental, and social well-being is present. The hazards in taking these steps will be discussed later.

Elastic concept. The second group of definitions relates health to an ability to resist threats of disease and pictures a positive interaction between the person or community and the environment. One of many definitions is Herbert Spencer's: "Health is the perfect adjustment of an organism to its environment." The concepts of herd immunity, attained when a certain proportion of the population is immunized, and of mental illness being a diseased state of an entire family are public health examples of this definition. By Spencer's definition, imperfect adjustment causes ill health or disease. Thus this concept also depends on a satisfactory picture of disease, whose presence or absence determines the absence or presence of health. How then to define and measure disease?

Disease and Its Exclusion

Most persons associate disease with conditions of the body which shorten the expectation of life or cause unusual symptoms or signs, discomfort, disability, or death. Dominating the late 19th and early 20th centuries was the belief that each disease had a specific cause. The diagnosis, treatment, and prevention of disease became the three basic elements of all medical systems. We thus are more certain that conditions are diseases when they can be recognized, labeled, and understood by physicians. When medical intervention helps these conditions, their classification as diseases seems no longer in doubt.

In recent decades, the multiple causation of disease became a more widely held doctrine, a doctrine that envisions the interplay of host, agent, and environment. The concepts of comprehensive medical care, psychosomatic medicine, and multiprofessional teams arose to deal with the complex mix of causes. Even when medical intervention fails to cure some conditions, the physician dominates in deciding whether disease is absent or present.

Thus, the concept of disease is closely related to what physicians do in society and to the degree of advancement of medical practice.

Helping the physician determine the presence or absence of disease are the less personal instruments of laboratory tests and other measuring devices, such as sphygmomanometers and electrocardiographs. With few exceptions, each new device tends to encourage the physician to classify as unhealthy an increasing proportion of the population.

On reviewing the past from this viewpoint, one realizes that some conditions previously classified as "diseases," because physicians did something about them, were no more than laboratory test results that refused to return to normal. The refractory serologic test for syphilis of two decades ago, and some instances of elevated blood pressure or serum cholesterol values today, are typical examples of such results.

Popular concepts of disease often differ from those of health professionals. The long Judeo-Christian tradition that sinful behavior caused illness has been largely replaced by other, more scientific explanations. It still persists, however, in such forms as the tendency for families to blame themselves for the occurrence of disease and in a sometimes excessive belief in the preventability of all illness. At the opposite extreme is the occasional persecuted physician who feels that his patients hold him responsible for their comfort and not just for treating their illnesses.

Measuring Health and Disease

To some extent, definition is a first step in measurement; it sets clear limits which should tell whether persons fall between or outside them. Measurement goes further to indicate a more precise position on a scale.

In seeking satisfactory definitions of health and disease, we must ask whether these concepts are truly independent or are merely different parts of the same entity. One way to clarify an ill-defined idea is to decide how it might be measured.

Lord Kelvin is reputed to have said, "If it exists, measure it." Man has followed this advice with such enthusiasm that he sometimes measures things before he is sure of their existence and definition. The mere attempt at measurement clarifies what is being measured. Indeed, vague entities, such as time or intelli-

gence, are often thought of by the way they are measured.

One useful guideline is that the same scale rarely measures entirely different entities. Different instruments are needed to measure length and time. In contrast, the same thermometer measures both heat and cold, which are merely different sections of the same scale. Do we, then, use the same or different instruments to measure health and disease?

With the individual patient, measurement begins with questioning and looking at him. Appropriate answers, rosy cheeks, glistening eyes, and an alert expression all suggest good health. Beyond looking well, it may be more difficult to assess the presence of "well-being"—the tranquil mind that is adjusted to self and to the external world and the even temper and good disposition that help the socially considerate person. These qualities of well-being need prolonged observation and are usually not assessed in a medical examination.

Then follow the physical examination and laboratory tests to exclude disease and disability. To an increasing extent, measurements for disease dominate the diagnostic examination of patients. No single action or test establishes more than the presence or absence of disease. In their written descriptions, physicians often acknowledge this situation by summarizing a system as "nothing abnormal detected," rather than by saying that the central nervous system is in excellent health.

Existing methods of measuring community health have been reviewed elsewhere (2-4). Most measures depend on statistics about deaths, the final extreme stage of disease. Even the conventional expectation of life is based on age-specific death rates in a stationary population, is determined by the average age at death, and is not the measure of health that may be thought of at first.

Infant mortality rates were once regarded as measures of the effectiveness of public health programs; good programs caused these rates to fall in a soul-satisfying manner. In the developed countries in recent years, however, further public health and medical efforts have had less impact than the earlier programs on infant death rates. It seems likely that, in former years, this index exaggerated the effectiveness of en-

vironmental health, communicable disease, and maternal and child health programs; now it reflects poorly the end results of chronic disease, mental health, and other recent programs.

Similarity to Measuring Temperature

Current efforts to assess the health of patients and communities mainly entail testing for the presence of disease, with no truly independent measure of health. This conclusion suggests that our long-lasting dualism about health and disease may be akin to the belief, held centuries ago, that heat and cold were separate entities. About 200 A.D., for example, the Greek physician Galen suggested that mixing equal weights of boiling water and ice would produce a neutral degree of heat.

At that time the human senses were the sole but inconsistent means of measuring temperature. The classification as hot or cold depended upon whether the object was above or below the temperature of the living measuring stick. The same room would be classified differently by the same person—hot if he came in out of a snow-storm or cold after he took a hot bath.

Around 1600 A.D., however, Galileo developed the first thermometer. This better measuring device greatly clarified ideas about temperature. "Hot" and "cold" were recognized as sections of a continuous spectrum. At only one point is heat completely absent—zero on the Kelvin scale and -273° on the Centigrade scale. Moreover, no upper limit or "point of positive heat" seems to exist.

Thus, cold is the absence of heat; we can measure intensity of heat but not the intensity of cold, for cold exists only in the mind. Similarly light and noise can be measured, but darkness and quiet cannot. Is it not also likely that disease will be measured more readily in the future, but that health will not? When we develop our own breakthrough in measuring health and disease, will we also find them to be different sections of the same scale, with the dividing point being the normal state of man? If so, the new scale may again have a zero point immediately above where death occurs. An upper limit may again be absent, with no "point of positive health." Rather, individual persons and communities may endlessly ascend the scale as man becomes increasingly able to cure

disease and to control his environmental and genetic hazards. At the same time, man's rising armamentarium of screening and diagnostic tests will persistently unveil other disease that remains to be eradicated.

Do Better Definitions Exist?

Existing definitions of health are phrased in terms of absence of disease. The major contribution of the open-ended definition of WHO was to emphasize that the absence of known disease is not sufficient; its major defect is that it infers that health and disease are different and mutually exclusive entities, not parts of the same spectrum. Its definers seemed to ignore the likelihood that presently unknown diseases will continue to be harbored by the population thought to be healthy, now and forever. These diseases prevent us from reaching perfect well-being, a nirvana for which society will continue to raise its standards and to have different standards in different geographic areas.

It is merely circular reasoning to define health in terms of the absence of disease without trying then to define disease. Nevertheless, if health and disease are different sections of the same continuum, their definitions should be complementary, just as hot objects have temperatures above 98.4° F. and cold objects are below that point.

Another quality of a better definition would be its recognition of a time factor. Two infants or communities may seem free from disease at a given moment. However, because one has been thoroughly immunized while the other has not, their likelihood of remaining well is different. Better definitions should account for contrasts in prognosis.

My tentative suggestion is that we adapt the old definition of Spencer. To account for prognosis, I would change his statement to "Health is the perfect, *continuing* adjustment of an organism to its environment." Conversely, disease would be an imperfect, continuing adjustment. Obviously the terms "perfect" and "imperfect" will need explanation; for example, biochemical changes, such as elevated blood glucose levels, will be considered imperfect adjustments.

This definition implies that the person who is free from disease will almost certainly feel well;

if he has well-being, however, he may or may not have disease. Thus, disease is the crucial concept to be understood, and health is the term given by society to those without known disease.

Will New Definitions Change Our Actions?

Better definitions arise only if we are dissatisfied with existing ones. Furthermore, they evolve and are accepted only if enough persons believe that clear definitions are important. Nevertheless, definitions may not greatly change the actions of health professionals who, in practice, will continue to be disease controllers rather than health promoters. Indeed, if the reasoning in the previous section is correct, health promotion will never be more than a euphemistic term for disease control. Future definitions should at least be compatible with our actions if we wish to remain an intellectually honest social movement. The WHO statement exposes public health to criticisms of intellectual dishonesty, even when we accept it with tongue-in-cheek and emphasize its idealism.

However, clearer goals can affect the expectation of what may be gained by more intensive efforts. Suppose a city doubled its expenditures

on public health programs. The pale and strained urban workers would not gradually change into a rosy-cheeked, healthy, and vigorous group. The additional resources would have intensified disease control activities; the increased funds would buy a reduced probability of contracting disease and a better continuing balance between the population and its environment. Perhaps there lies the main reason why concepts of health and disease should be realistic rather than idealistic.

REFERENCES

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- (3) Report of a study group: *Measurement of levels of health*. WHO Technical Reports Series No. 137, World Health Organization, Geneva, 1957.
- (4) Crew, F.A.E.: *Health, its nature and conservation*. Pergamon Press, New York, 1965.

Teasheet Requests

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Education Notes

Doctorate in Medical Care Organization. Fellowships for a program of study leading to a Ph.D. degree in medical care organization are available from the University of Michigan.

The program is intended to prepare students for careers in teaching, research, and policy formulation in the sociological, economic, and administrative aspects of medical care organization. Designed to be completed in 3 years, the program is intended to provide competence in medical care, relevant aspects of sociology, economics, political science, or psychology; and research methods.

Fellowship stipends begin at \$2,400 for the first year with increments for succeeding years. Stipends are supplemented by an additional \$500 for each dependent and full tuition. The deadline for application for the fall term 1970 is March 30, 1970.

For applications or additional information, write

to Benjamin J. Darsky, Chairman, Doctoral Program in Medical Care Organization, Department of Medical Care Organization, School of Public Health, University of Michigan, Ann Arbor, Mich. 48104.

Master's Program in Mental Health Statistics. The biostatistics department of the University of North Carolina is accepting applications for admission to a master's degree program in mental health statistics.

The program, which will begin in September 1970, will consist of two academic semesters of courses in statistics, epidemiology, public health, and the application of statistics to mental health, followed by 10-12 weeks of field training. The field training will consist of summer work in an agency concerned with mental health statistics. This 11-month program will lead to a master of science in public health.

Additional information is available from Dr. Donna R. Brogan, Biostatistics Department, University of North Carolina School of Public Health, Chapel Hill, N.C. 27514.